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Department of Transportation
Docket Operations PL-401
400 7th Street SW
Washington DC 20590

Docket: NHTSA 2002-13546 Event Data Recorders

Every year NHTSA expends about 250 million dollars on programs with states and
organizations in an effort to reduce traffic deaths and disabilities, primarily by increasing
restraint use and decreasing drunk driving. Requiring vehicle EDR's with the capability
to rapidly download data to EMS personnel at the scene of the crash can produce
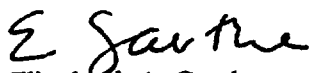survivability benefits similar to these current NHTSA programs at relatively low cost.

A statewide, population-based study we completed in conjunction with the Massachusetts
Department of Public Health and the Governor's Highway Safety Bureau showed that
triaging seriously injured persons to the most appropriate medical facility by the most
appropriate method of transport made a 2 :1 difference in survivability. This result puts
correct triage approximately equal to restraint use in importance to survival.

A key to this survivability improvement is making scene triage more objective and
therefore less prone to errors and external influence. Crash severity metrics computed
from data downloaded from EDRs at the scene of the crash can provide the "on the spot"
objective triage data EMS currently lacks. This capability can be added to future EDRs for
about $1 per unit. Attached are our three slide presentations to the current IEEE P1616
EDR Working Group describing the details of the scene use of EDR data for EMS triage
decision-making. We also presented similar information to NHTSA's earlier EDR
workgroup.

Opportunities to make a survivability improvement of this magnitude are rare. We
request that NHTSA include the necessary technical specifications (as outlined in our
presentations) to permit on-scene EMS use of EDR data in any standard NHTSA creates.

Please contact us at 781-631-1553 or garthe@attglobal.net or hsresearch@attglobal.net
if you have any questions.

Sincerely,

Elizabeth A. Garthe   Nicholas Mango
Garthe Associates   Health & Safety Research Inc.

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Technical Specifications to Permit Real Time Medical Use of Motor Vehicle EDR Data to Save Lives

Prepared by

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IEEE Motor Vehicle EDR Standards Working Group Meeting

July 30, 2002

Garthe Associates

- Experts in the collection, organization and analysis of state and national medical and crash data

- Advisors to state agencies such as: health departments, traffic safety offices, emergency medical services as well as state trauma systems

- Multiple technical papers related to crash injuries and injury systems, including EMS and air medical response to MVCs and SAE paper on use of EDR data

- Member of NHTSA EDR Workgroup

- Developers & Instructors - SAE course on Crash Injury Data

Historic Opportunity for IEEE Working Group

- IEEE Motor Vehicle EDR WG has an opportunity to set an important technical data recording standard.

- The standards set by the technical committee will determine whether medical use of EDR data is possible.

- Medical use of EDR data in real time can save the lives of the owner/occupants of vehicles.

Real Time Medical Use of EDR Data Benefits Vehicle Occupants

- Majority of EDR data applications are "static", i.e., not real time. Such applications benefit:
  - Law enforcement
  - Society as a whole, through better vehicle and roadway design
  - Government & private researchers
- None of these "static" applications directly benefit the vehicle owner/occupants
- <u>Only Real Time Medical use has the ability to directly save the lives - or reduce disabilities - of the occupants of the vehicle</u>

Real Time EDR Data Can Save Lives

- Statewide study performed by Garthe Associates showed:
  - 50% of persons, even in fatal crashes, **do not** die at the scene - outcome can be influenced by EMS response
  - Type of transport and destination greatly affect outcome
  - 2 : 1 difference in lived to died ratio with transport type and destination hospital type
  - Over 3 : 1 difference in lived to died ratio by region

- Real Time EDR Data can optimize EMS response by predicting the most appropriate transport and destination, thus increasing the lived to died ratios for motor vehicle crash victims & saving lives

Technical Considerations Related to Real Time Medical Use

- Appropriate IEEE technical standards vital to permitting real time medical use of EDR data.

- Real time Medical Use Requires:
  - Specification for operator activation and verification of system status
  - Specifications to assure Rapid Download
  - Specifications to assure Priority Download
  - Specifications for Security and Confidentiality

Operator Verification of System Status

- For real time medical use, the operator of the vehicle must be able to confirm that the system is enabled and operational. This requires a technical standard for a system indicator.

- The indicator could be a dashboard mounted "check light" similar to those used by airbag systems, that briefly illuminates when the ignition key is turned to the ignition position.

- This light would indicate that the system had passed its internal self checks and that the EDR system is enabled for priority medical download use.

Rapid Download

Real Time Medical Use requires that the data be rapidly accessible by EMS personnel. This requires technical standards for:

- Rapid, non-contact EDR download method – such as by infrared (IR) protocol used by commercial hand held devices

- Standardized location so EMS knows where to point device to download

- Hardening of EDR to prevent destruction

- On board power within EDR to assure download if vehicle electrical system shorted out or non-functional

Priority Download

- Real Time Medical Use requires that download time be minimized. This requires a technical specification for:

  – A priority download data element subset, specified by internal data flags

  – The flagged elements would constitute the minimum elements necessary for medical use

  – The EDR would respond to a medical download request only by transmitting the priority elements

  – Priority download uniform, so all EMS can interpret data instantly

  – Priority download becomes part of individual's medical record

Security & Privacy

- Federal government has taken the position that private vehicle EDR data belongs to the vehicle owner.

- EDRs, which record operator actions, should have inherent technical capability for data protection and security - encryption

- Operator/owner should be able to allow specific data to be priority downloaded for medical use

- Download of any data should only be possible after a crash event "trigger"

Summary: Real Time Medical Use Vital to Private Owner

- It is vital that the IEEE Committee set standards that provide the technical capability for EDRs to benefit private vehicle owners

- This requires that the committee include in its EDR standard the four attributes that permit the real time medical use of EDR data -Verification of System Status, Rapid Download, Priority Download and Security & Confidentiality

- Real Time Medical Use of EDR data is the <u>only</u> application for EDR data that <u>directly</u> benefits the owner/occupant. <u>It can save their lives</u>.

- There is no more important application.

EDR Data - Key for Medical Triage

Prepared by

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IEEE Motor Vehicle EDR Standards Working Group Meeting

December 3, 2002

What is Medical Triage?

- Every day when car crashes occur, emergency medical personnel must make decisions at the scene on how seriously injured people are, and how and where to transport them. This is called "triage".

- Part of the triage process is highly <u>subjective</u>, and prone to error. This is the part EDR data can enhance.

- The survival of seriously injured people is greatly affected by the triage decisions made at the scene of a crash.

Levels of Capability

- Transport methods vary by speed and capability, from Basic Life Support (BLS) to a helicopter Air Medical transport.

- Hospitals vary by capability, with a Level I Trauma Center having the most capability.

- Emergency personnel must "triage" each injured person, selecting the most appropriate transport method and hospital.

How Triage Works

- 3 types of data are used in Triage decisions
  - Anatomic data – the injury description, such as a fractured pelvis or femur (thigh)
  - Physiologic data – the person's "vital signs", such as blood pressure, respiration and pulse
  - Mechanism of Injury (MOI) – what caused the injury, such as a "high speed" car crash
- About 85% of triage decisions are based on MOI, a <u>subjective</u> measure –(Dr. Martinez)

The Result of Triage Errors

- Over-Triage – people who are not seriously injured are transported to high level hospitals by high level methods, increasing costs and preventing these limited resources from being used by others.

- Under-Triage – people who are seriously injured are transported by a method or to a hospital not prepared to handle the severity of their injuries. Under-triage can be deadly.

Massachusetts Statewide Study

- Conducted by Garthe Associates under the auspices of the Massachusetts Department of Public Health
- All crashes with a fatality for 1 year
- For study year, Mass lowest fatality rate in US
- More than 400 crashes studied
- Followed medical treatment for all persons involved – over 1,000 people
- Study evaluated triage effectiveness, <u>how</u> injured people were transported, to <u>what level</u> of hospital they went, and their <u>outcome</u>.

Study Triage Findings

- Study found that triage was not objective.
  - Emergency personnel had to guess about crash severity and restraint use when triaging.
- 15% of seriously/fatally injured sent by helicopter, while 4 times that number may have "qualified".
- <u>2 : 1 difference</u> in survivability depending on triage choices made.
- This suggests the triage decision nearly equivalent in importance to outcome as restraint use.
- Indicated emergency personnel needed more objective data to assist triage decision making.

EDR Data Needed for Medical Triage

- ## Crash severity
  - The time history and direction of crash force

- ## Restraint use for occupants
  - Belts, airbags

These minimum data elements provide objective data that can enhance MOI triage decisions.

These elements were among those recommended by the ITS Medical Committee in its paper on medical crash data use, and are supported by the Garthe Associates Massachusetts statewide study.

Data Also Needed by Others

- The same data required for real time medical use is also needed by other users.

- Transportation, Public Safety, Insurance, Crash Reconstruction, Engineering and Manufacturer applications also require crash severity and restraint use

- Medical triage use needs the data to be available at the scene in real time.

Summary

- Real time EDR data at the scene can improve triage decisions by providing objective crash severity and restraint data.

- Data suggests accurate triage decision making can improve survivability by 2:1

- Few data elements are needed – (and these are needed for other users as well).

- Medical triage is the only EDR use that could save the lives of the vehicle owner or occupants.

Acknowledgements

- ACS Triage Guideline
- Massachusetts HURC Triage Guideline
- Massachusetts Statewide Fatality Study, Garthe Associates for MDPH
- ITS Medical Committee Paper on medical use of vehicle data recorder data
- Massachusetts Air Medical Studies –by Garthe Associates for MDPH

Potential to Save Lives with Real Time Medical Use of MV EDR Data - Using RFID Technology -

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IEEE Motor Vehicle Event Data Recorder Standards Working Group Meeting

- Document #114 on IEEE Publications List -

February 2003

Garthe Associates

- Experts in the collection, organization and analysis of state and national medical and crash data

- Advisors to state agencies such as: health departments, traffic safety offices, emergency medical services as well as state trauma systems

- Multiple technical papers related to crash injuries and injury systems, including EMS and air medical response to MVCs and SAE paper on use of EDR data

- Member of NHTSA EDR Work Group

- Developers & Instructors - SAE course on Crash Injury Data

How EDR Saves Lives

- Data from EDRs, if obtained quickly at the scene of a crash, can help EMS personnel make better decisions on where and how to transport the injured

- This decision is about as important to a seriously injured person's outcome as the use of a belt restraint system.

The Crash Scene

- At the scene of a crash, EMS personnel must decide how and where to transport injured personnel – the triage decision
  - How - BLS, ALS, Air Medical
  - Where - Community hospital or one of several levels of Trauma Center
- The decision how and where to transport is subjective and prone to error and external pressures
- This decision made has a profound effect on outcome for seriously injured persons

The Supporting Study

- Massachusetts Statewide study by Garthe Associates for DPH & Highway Safety Office
- Extensive project involving multiple state agencies, complex data linkage
- Any crash with a fatality; >400 crashes
- Tracked all persons involved, no matter how seriously injured; > 1,000 persons
- Entire state and one full year
- For study year, State had lowest fatality rate in the world, 6/100,000 population

Study Results

- 50% of persons, even in fatal crashes, **do not** die at the scene - outcome can be influenced by EMS response

- <u>**2 : 1 difference in lived to died ratio by transport type and destination hospital**</u>
  - Similar benefit ratio as belt restraint use

- Study included a review of current triage guidelines that showed additional information needed to refine decisions

Technical Needs for Real Time Use

- The entire scene download process must be fast and highly reliable – data desired for >90% of the most serious crashes
  - Fire damage involved in low percent (<2.7% fatals per Sarah McComb's slides, December 2002)
  - Only "priority" elements needed

- Download must be secure

Technology that Matches Needs

- RFID

- Radio Frequency IDentification

- No cables required to access EDR

- Enables fast "interrogation" of EDR at scene of crash

- Readout via a hand held device used by emergency medical personnel

Attractive RFID Characteristics

- Non-contact readout with about 1 meter range
- Technology proven – "smart cards" used in theme park rides, warehousing, subways tokens
- No vehicle power source required for download– powered by RF field from readout device
- Extremely rugged – mil spec temperature range / shock/vibration units commonly available
- Highly survivable - only the single chip and a small printed circuit antenna must survive for data to be readable – rest of vehicle can be destroyed
- Low cost – under $1 per unit and falling

How RFID Would Work

- Do not have to search for EDR location in vehicle – just hold reader in interior
- Don't have to cart around power supply
- Don't have to try and plug into a non-hardened connector that may be damaged
- NHTSA data shows that hard connector method is resulting in ~35% NASS failure rate – (237/684 fail per McComb slides)
- Hard connectors are not a solution
- Don't need complex download training

Results

- EMS personnel would have objective numbers to back up their decision to use higher level transports and hospitals

- Reviewers would have objective data to evaluate EMS decision making

- Result would be enhanced match of injured persons to the most appropriate type of transport and hospital

- Lives will be saved

Summary

- The IEEE P1616 Committee should ensure that the final EDR standards encompass real time medical use of EDR data

- RFID for EDR download satisfies the needs of real time use, and offers the benefits of simplicity, ruggedness and survivability compared to hard wired download systems
  – for all users

Priority Application

- Real Time Medical Use of EDR data is the <u>only</u> application for EDR data that <u>directly</u> benefits the owner/occupant. <u>It can save their lives.</u>

- There is no more important application

- For additional information: see July 2002 Garthe Associates presentation #66 & #84 and December 2002 presentation by Garthe, Martinez and Mango to IEEE P1616